What is claimed is:

1. A method for forming a field emitter device on a substrate, comprising:

forming a polysilicon cone on the substrate;

forming a porous oxide layer on the substrate, wherein the porous oxide layer and the polysilicon cone are formed from a single layer of polysilicon;

forming a gate layer on the porous oxide layer;

isolating the polysilicon cone from the gate; and

forming an anode opposing the polysilicon cone.

Sub A1

2. The method of claim 1, wherein forming the field emitter device on a substrate includes forming the device on a silicon dioxide (SiO_2) substrate.

3. The method of claim 1, wherein forming the polysilicon cone and the porous oxide layer from a single layer of polysilicon includes masking a cathode region on the substrate.

4. The method of claim 3, wherein masking the cathode region includes:

forming a oxide-nitride-oxide (ONO) mask over the cathode region;

forming the porous oxide layer;

removing the top oxide from the ONO mask;

etching the nitride to reduce the width of the mask; and

forming the gate layer on the porous oxide and the mask.

5. The method of claim 3, wherein masking the cathode region includes:

forming an oxide layer over the cathode region;

forming a first nitride layer over the oxide layer in order to form a structure which reflects the final pattern of the gate layer;

forming a second nitride layer over the first nitride layer and the single polysilicon layer;

etching the second nitride layer, leaving the second nitride layer only on the sidewalls of the structure; and

forming the porous oxide layer;

removing the first and second nitride layers; and

forming the gate layer on the porous oxide and the oxide layer.

6. The method of claim 5, wherein forming the porous oxide layer includes:

performing an anodic etch on the single polysilicon layer in an insulator region of the substrate to form porous polysilicon; and

oxidizing the porous polysilicon.

Sub A1

7. The method of claim 1, wherein forming a polysilicon cone includes forming a metal silicide on the polysilicon cone.

8. The method of claim 7, wherein forming a metal silicide on the polysilicon cone includes using a electron beam to deposit molybdenum (Mo) on the polysilicon cone.

9. The method of claim 1, wherein forming a gate on the porous oxide layer includes forming a refractory metal gate.

10. The method of claim 1, wherein isolating the polysilicon cone from the gate includes:

shaping the gate material in close proximity to a top surface of the polysilicon cone using a lift-off technique; and

removing the porous oxide layer adjacent to the polysilicon cone.

11. The method of claim 1, wherein forming the porous oxide layer includes:

performing an anodic etch on the single polysilicon layer in an insulator region of the substrate to form porous polysilicon; and

oxidizing the porous polysilicon.

12. A field emitter device on a substrate, comprising:

a cathode formed in a cathode region of the substrate;

a gate insulator formed in an insulator region of the substrate;

a gate formed on the gate insulator; and

an anode opposing the cathode, the field emitter device formed by a method comprising:

forming a polysilicon cone on the substrate;

forming a porous oxide layer on the substrate, wherein the porous oxide layer and the polysilicon cone are formed from a single layer of polysilicon;

forming a gate layer on the porous oxide layer;

isolating the polysilicon cone from the gate; and

forming an anode opposing the cathode.

13. The field emitter device of claim 12, wherein forming the polysilicon cone and the porous oxide layer from a single layer of polysilicon includes masking a cathode region on the substrate.

14. The field emitter device of claim 13, wherein masking the cathode region includes:

forming a oxide-nitride-oxide (ONO) mask over the cathode region;

forming the porous oxide layer;

removing the top oxide from the ONO mask;

etching the nitride to reduce the width of the mask; and

forming the gate layer on the porous oxide and the mask.

15. The field emitter device of claim 12, wherein masking the cathode region includes:

forming an oxide layer over the cathode region;

forming a first nitride layer over the oxide layer in order to form a structure which reflects the final pattern of the gate layer;

forming a second nitride layer over the first nitride layer and the single polysilicon layer;

etching the second nitride layer, leaving the second nitride layer only on the sidewalls of the structure; and

forming the porous oxide layer;

removing the first and second nitride layers; and

forming the gate layer on the porous oxide and the oxide layer.

16. A method for forming a field emitter device on a substrate, comprising:

forming a cathode on the substrate;

forming a gate insulator layer on the substrate, wherein the gate insulator layer and the cathode are formed from a single layer of polysilicon;

forming a gate layer on the gate insulator layer;

isolating the cathode from the gate; and

forming an anode opposing the cathode.

17. The method of claim 16, wherein forming the field emitter device on a substrate includes forming the device on a silicon dioxide (SiO_2) substrate.

18. The method of claim 16, wherein forming a polysilicon cone includes forming a metal silicide on the polysilicon cone.

19. The method of claim 16, wherein forming a gate on the porous oxide layer includes forming a refractory metal gate.

20. A method of forming a field emitter array on a substrate, comprising:

forming a number of cathodes on the substrate;

forming a gate insulator layer on the substrate, wherein the gate insulator layer and the number of cathodes are formed from a single layer of polysilicon;

forming a gate layer on the gate insulator layer;

isolating the number of cathodes from the gate; and

forming a number of anodes opposing the number of cathodes.

21. The method of claim 20, wherein forming the field emitter array on a substrate includes forming the array on a silicon dioxide (SiO_2) substrate.

22. The method of claim 20, wherein forming the gate insulator layer includes forming a porous oxide layer.

23.. A method of forming a flat panel display, comprising:

forming a field emitter array on a substrate, including:

forming a number of cathodes on the substrate;

forming a gate insulator layer on the substrate, wherein the gate insulator layer and the number of cathodes are formed from a single layer of polysilicon;

forming a gate layer on the gate insulator layer;

isolating the number of cathodes from the gate;

forming a number of anodes opposing the number of cathodes;

coupling a row decoder and a column decoder to the field emitter array; and

coupling a processor to the row and column decoders.

24. The method of claim 23, wherein forming the field emitter array on a substrate includes forming the array on a silicon dioxide (SiO_2) substrate.

25. The method of claim 23, wherein forming a number of cathodes on the substrate includes forming a number of polysilicon cones on the substrate.

26. A method for forming a field emitter array on a substrate, comprising:

forming a number of polysilicon cones on the substrate;

forming a porous oxide layer on the substrate, wherein the porous oxide layer and the number of polysilicon cones are formed from a single layer of polysilicon;

forming a gate layer on the porous oxide layer;

isolating the number of polysilicon cones from the gate; and

forming a number of anodes opposing the number of polysilicon cones.

27. The method of claim 26, wherein forming the porous oxide layer includes:

performing an anodic etch on the single polysilicon layer in an insulator region of the substrate to form porous polysilicon; and

oxidizing the porous polysilicon.

28. The method of claim 26, wherein forming a polysilicon cone includes forming a metal silicide on the polysilicon cone.

29. A method of forming a flat panel display, comprising:

forming a field emitter array on a substrate, including:

forming a number of polysilicon cones on the substrate;

forming a porous oxide layer on the substrate, wherein the porous oxide layer and the number of polysilicon cones are formed from a single layer of polysilicon;

forming a gate layer on the porous oxide layer;

isolating the number of polysilicon cones from the gate;

forming a number of anodes opposing the number of polysilicon cones;

coupling a row decoder and a column decoder to the field emitter array; and

coupling a processor to the row and column decoders.

30. The method of claim 29, wherein forming the porous oxide layer includes:

performing an anodic etch on the single polysilicon layer in an insulator region of the substrate to form porous polysilicon; and

oxidizing the porous polysilicon.

31. The method of claim 29, wherein forming a gate on the porous oxide layer includes forming a refractory metal gate.